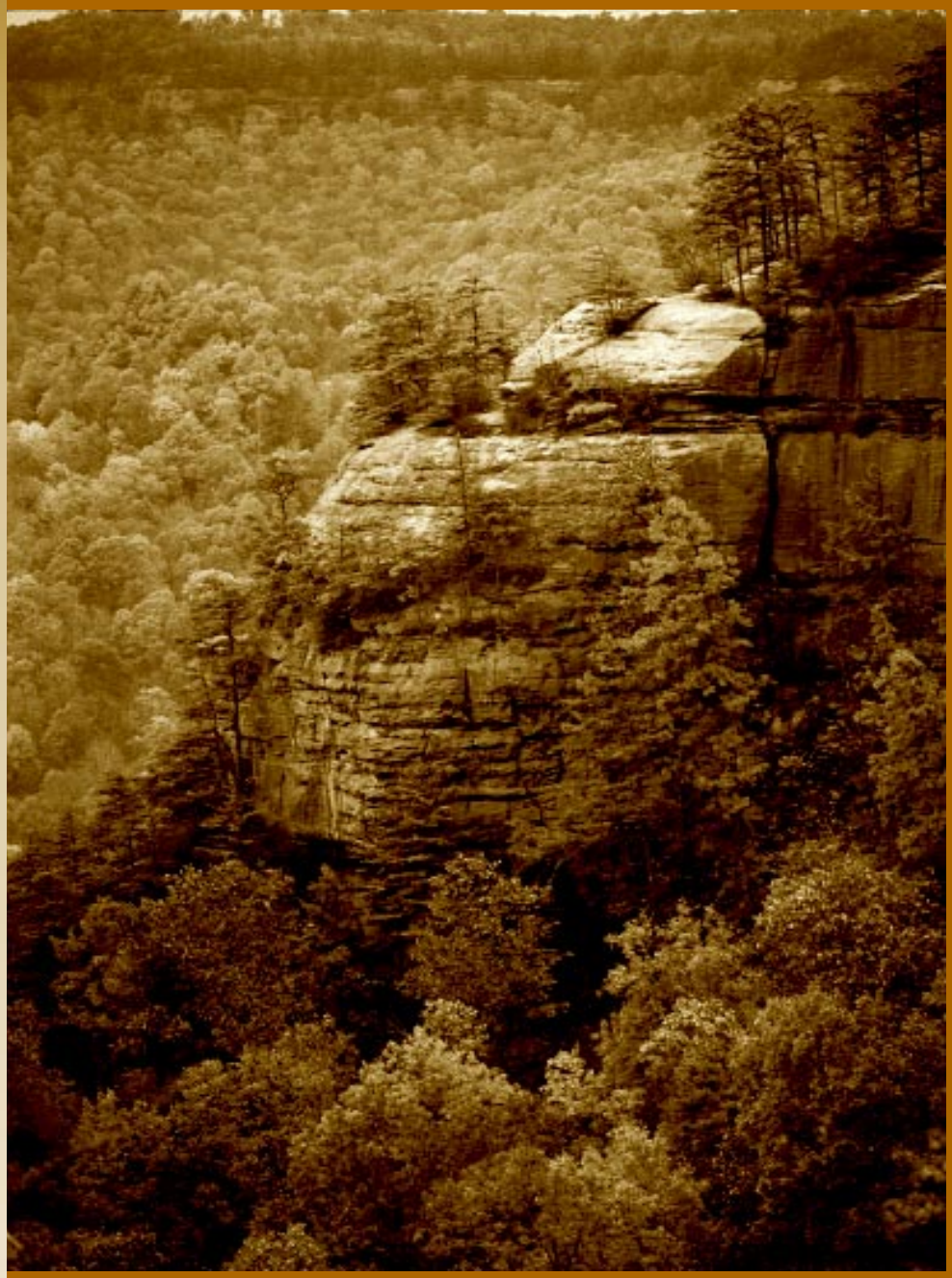
Chapter 7

Resource Extraction



RESOURCE EXTRACTION

COAL PRODUCTION

Indicator 1. Coal Production and Consumption

Background Kentucky's coal resources not only help to meet national and state energy needs, they also contribute to state and local economies. During 1999, the market value of coal mined in the state was approximately $32.4 billion. That year the coal industry employed 17,264, earning $749 million in wages.[1]

Since 1790, 8.1 billion tons of coal have been mined in Kentucky.[2] The Kentucky Geologic Survey (KGS) estimates that there are 95 billion short tons of coal reserves remaining in the state.[3] KGS estimates that less than 50 percent of this total is recoverable given current mining methods and land use restrictions.[4] However, the Energy Information Administration estimates that there are 32 billion short tons of coal reserves in Kentucky. The Energy Information Administration estimates 28.6 billion short tons would actually be mineable.[5]

Coal has been mined in Kentucky during the past 200 years and is found in two regions of the state—the Eastern Kentucky Coalfield and the Western Kentucky Coalfield. In 1999, 79 percent of the coal extracted in the state was mined in the Eastern Kentucky Coalfield. This coalfield contains 45 mineable beds.[6] The average heat content of the coal is about 13,000 Btu per pound with a sulfur content of 1 to 2 percent.[7] In the Western Kentucky Coalfield, there are 10 mineable coalbeds. The heat content is slightly lower than in the eastern field and the sulfur content is higher at about 3 to 4 percent.[8]

At a Glance

Coal mined (tons)
total to date 8.1 billion
1999 . . . . . 144 million

Remaining coal reserves (tons)
total . . . . .32-95 billion
mineable . . 28-47 billion

Coal mined by region (tons) (2000)
East Ky. . . . .105 million
West Ky. . . . 27 million

The Eastern Kentucky Coalfield has become the state's primary source of coal production. Four counties (Pike, Knott, Martin, Perry) accounted for 40 percent of the coal mined in Kentucky in 1999 (144 million short tons). Pike County remains the leading coal producer in the state with 35.7 million tons mined in 1999 (25 percent of the coal output in the state).

Goal Foster the conservation and efficient recovery of coal resources while protecting health, safety and the environment.

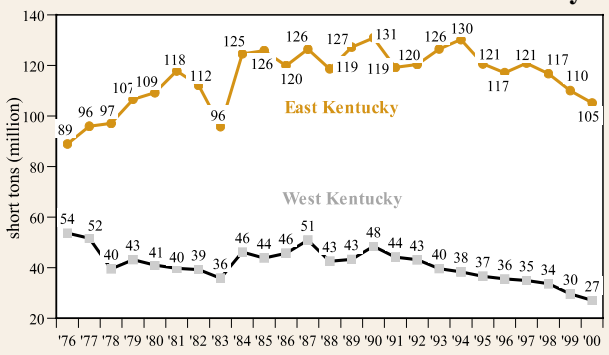
Progress Nationwide coal production increased 23 percent between 1986 to 1999.[9] In Kentucky, long-term coal production trends have remained fairly constant since 1984. However, during the past year, trends reveal an 8 percent drop in coal production levels in the state. Statewide coal production has declined primarily in response to competition from Western states, where the coal is easier and less costly to mine, lower in sulfur content and more plentiful.

Trends reveal a 35 percent decline in coal mined in western Kentucky between 1990 and 1999. This is because western Kentucky coal is higher in sulfur content, making it less desirable to power plants that are working to reduce sulfur dioxide emissions as required under the Clean Air Act Amendments of 1990. Kentucky coal, however, is expected to remain strong in the marketplace due to its high Btu heat content,

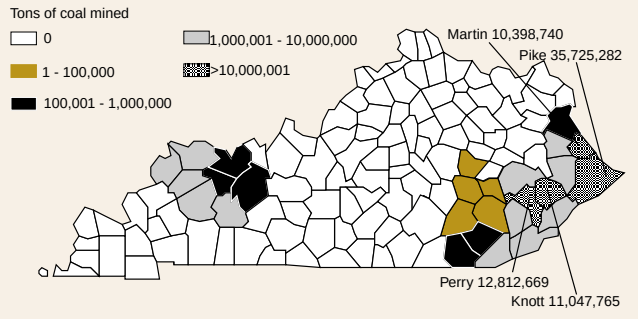
Measure 3. Top 10 Coal Producing States

State	Million short tons 1996	1999
WY	278	334
WV	170	156
KY	159	144
PA	68	76
TX	55	53
MT	38	41
IL	47	40
IN	30	34
ND	30	30
NM	24	30

Measure 1. Coal Production in Kentucky



Measure 2. Coal Production in Kentucky (1999)



Coal Production

relatively low price and increasing demand brought on by higher natural gas prices due to deregulation. Coal energy consumption levels at the national level increased 16 percent between 1984 and 1998. In Kentucky, coal consumption has far exceeded the national average and increased 34 percent between 1984 and 1999, primarily in response to economic growth and increasing demand for electricity.

The majority of the coal produced in Kentucky is consumed by coal-fired power plants. Kentucky power plants reported consuming 34.46 million short tons of coal in 1999, according to the Kentucky Division for Air Quality. Coal fuels 95 percent of all electric power generated in the state.[10] In 1998, the average price paid for Kentucky coal by power plants was $24.52 per short ton compared to the national average of $25.64. That year, Kentuckians paid $.056 per kilowatt-hour for electricity—the third-lowest rate in the country. But cold winters and skyrocketing natural gas prices combined with growing energy demand have led to recent price hikes for coal. Industry leaders reported in January 2001 that some spot-market coal prices had jumped from $18 per ton six months ago to between $48 and $55 a ton. A weekly price survey in the Jan. 29, 2001, edition of the trade publication *Coal Outlook* showed high-quality spot-market coal loaded at the Big Sandy River docks bringing an average of $37 a ton. Coal production is expected to increase in Kentucky due to rising prices and increased demand.

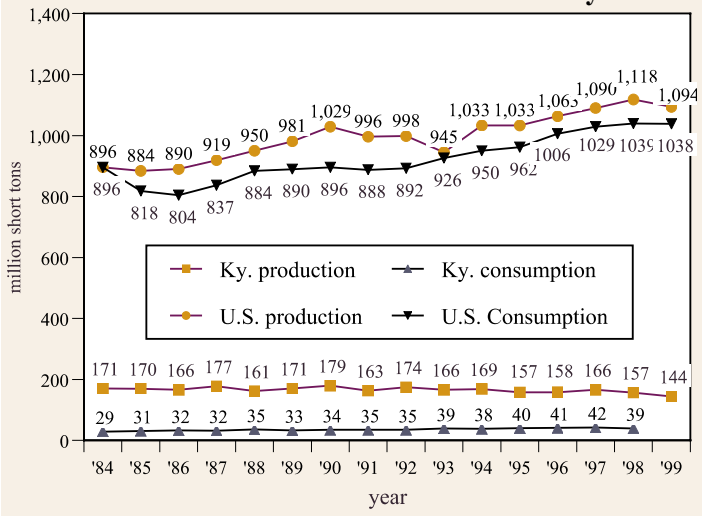
Measure 4. Coal Reserve Base Top 10 Producing States 1997

State	million short tons
WY	67,814
WV	35,397
KY	**32,040**
PA	28,646
TX	12,931
MT	119,676
IL	105,069
IN	9,916
ND	9,395
NM	12,483
U.S.	**507,739**

Measure 5. Price of Coal Delivered to Electric Utilities in 1999

State	Average $
ND	$9.60
MT	$12.23
WY	$13.48
TX	$18.26
IN	$23.59
NM	$24.49
KY	**$24.52**
IL	$28.15
WV	$29.35
PA	$33.00
U.S.	**$25.64**

Measure 6. Coal Production/Consumption in the United States and Kentucky



Footnotes

1. Coal Industry Annual, 1999, U.S. Energy Information Adm.
2. Coal Occurrence in Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coaloccurrences.html.
3. U.S. Coal Profile: Kentucky 1997, U.S. Energy Information Adm.
4. Ibid.
5. Kentucky Coal Production 1790-1999, Ky. Geological Survey, Web site - http://128.163.49.71/pub/web/wrs/KYCOAL99.htm.
6. Available Coal Resources in Eastern and Western Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coal/availab.htm, September 2000.
7. Coal Occurrence in Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coaloccurrences.html
8. Demonstrated Reserve Base of Coal by State, Table 8, Energy Information Administration, 1997.
9. Kentucky Coal Facts 1999-2000, page 5, Kentucky Coal Association, December 1999.
10. U.S. Energy Information Administration, Web site - http://www.eia.doe.gov/cneaf/electricity/st_profiles/kentucky/ky.html.

Measures - notes and sources

Measure 1. *Source: U.S. Energy Information Adm.*
Measure 2. *Source: Ky. Department of Mines and Minerals.*
Measure 3. *Source: U.S. Energy Information Adm.*
Measure 4. *Demonstrated reserve base. 1997 most recent data available. Includes anthracite, bituminous, subbituminous and lignite coal. Source: U.S. Energy Information Adm.*
Measure 5. *Source: U.S. Energy Information Adm.*
Measure 6. *Does not include consumption by independent power producers. Source: Ky. Geological Survey, U.S. Energy Information Adm., Ky. Department of Mines and Minerals.*

Indicator 2. Coal Mines and Mining Methods in Kentucky

Background Between 1978 and 1999, an estimated 1.18 million acres, or 5 percent of the state's 25.8 million acres of land, were permitted for coal mining.[1] It should be noted that not all surface acreage permitted for coal mines is actually disturbed. For example, acreage overlaying underground mines must be included in permits but most underground mines actually disturb very little surface acreage. Historical data is not available to determine the total acreage of land actually disturbed by coal mining. In 1999, there were 583 active coal mines in Kentucky.[2] Those permits covered 40,000 acres of land. A majority of this acreage, 98 percent, was in Eastern Kentucky.

The mining of coal in Kentucky has changed over the past century as new technologies have been developed and federal and state laws governing its removal have been enacted. Coal mines in Kentucky, which once numbered in the thousands, have declined to fewer but larger operations. Surface mining, once widely used in Kentucky during the 1970s and 80s, began to decline as large tracts of high quality surface reserves diminished. Underground mines have now become the principal method used in Kentucky to extract coal.

Goal Foster the conservation and efficient recovery of coal resources while protecting health, safety and the environment.

At a Glance

Acres of land permitted for coal mining to date. . . . . 1.8 million

Number of coal mines
1990 987
1995 598
1999 583

Mining methods (tons) (1999)
surface . . . . . 55 million
underground . . 89 million

Progress The number of Kentucky coal mines fell from 1,858 in 1985 to 682 in 1999, 583 of which are active operations.[3] The drop is attributed to several factors including the repeal of the state's two-acre mine exemption in 1987 and a shift from small independent coal companies to large diversified firms. Many small firms left the industry or merged as coal prices fell and companies could not recover their costs.

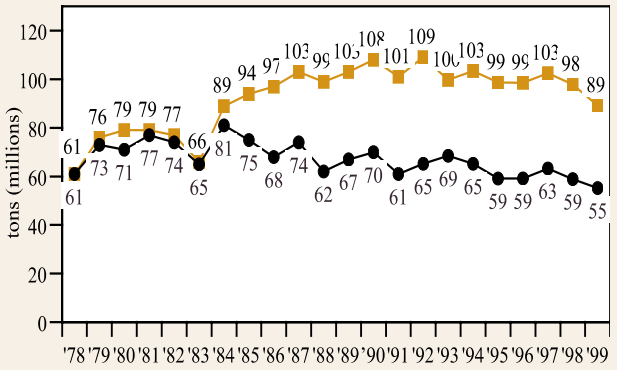
Coal production per mine has more than tripled since 1985 and now averages 304,000 short tons per year. The state's largest mine, Baker, owned by Lodestar Energy Inc., produced 4.48 million short tons of coal during 1999.

Acreage permitted for coal mining continues to decline. For example, between 1995 and 1999, the number of acres permitted for coal mining fell 40 percent, from 67,000 acres to 40,000 acres. The number of acres disturbed by coal mining in Kentucky (being mined or in some stage of reclamation) has averaged 260,000 acres per year over the past several years.[4]

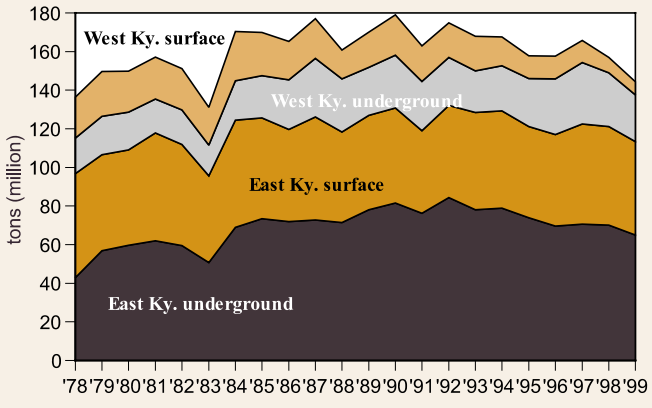
Nearly 62 percent of the 144 million tons of coal mined in Kentucky during 1999 used underground mining methods. In eastern Kentucky, 57 percent of the coal was extracted using underground mining methods. In western Kentucky, 78 percent of the coal mined used underground mining methods.

One particular type of coal mining method—mountain top removal—has recently come to the forefront of public attention because of a recent proposal to mine Black Mountain, the state's highest peak. The mineral rights to the mountain have since been purchased by

Measure 1. Coal Mining Methods in Kentucky

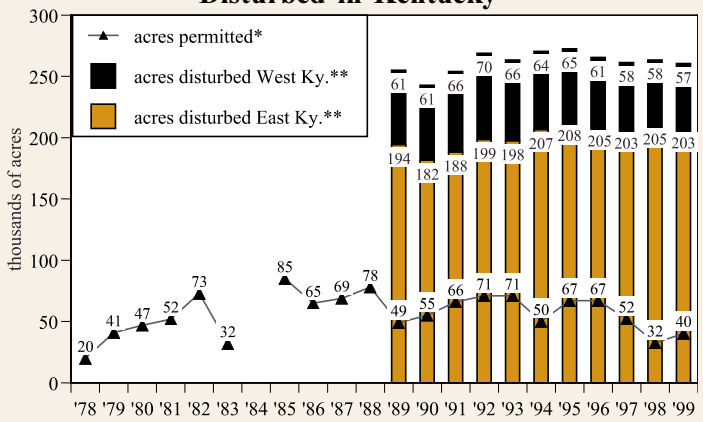


Measure 2. Coal Mining Methods in Kentucky by Region

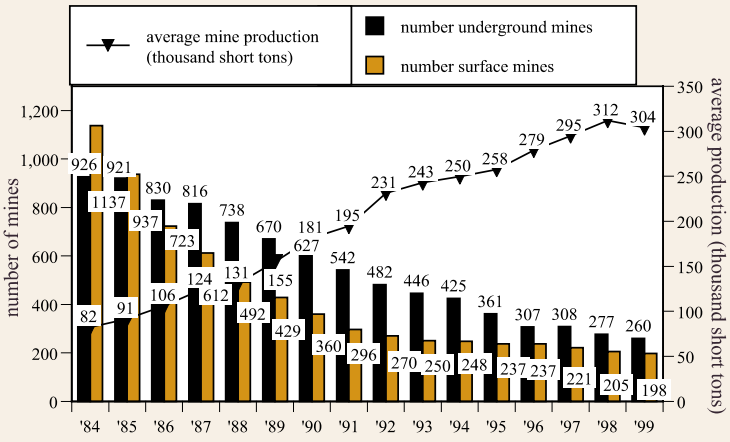


Coal Mines

Measure 3. Coal Mine Acres Permitted and Disturbed in Kentucky



Measure 4. Coal Mines and Average Production in Kentucky



Measure 5. Top 10 Producing Mines in Kentucky (1999)

Company	Mine	County	Tonnage
Lodestar Energy Inc	Baker	Webster	4,448,451
Webster County Coal	Dotiki	Webster	4,223,401
Peabody Coal Co.	Camp 11	Union	3,711,043
Peabody Coal Co.	Camp 1	Union	3,003,835
Roberts Bros Coal	Cardinal 2	Hopkins	1,877,372
Kenamerican Resources	Paradise 9	Muhlenberg	1,838,058
Addington Mining	# 4	Martin	1,749,898
Shamrock Coal Co. Inc.	18-19 (46)	Leslie	1,737,874
Addington Mining Inc.	0218-w	Breathitt	1,588,572
Bledsoe Coal Corp.	#4 (1)	Leslie	1,512,295
Total top 10			**24,329,626**
Total state			**139,626,000**

the state. Mountaintop operations are those mines that remove all or a large portion of a coal seam or seams running through the upper fraction of a mountain or ridge. The mine spoil is often disposed in adjacent mountain valleys. Since 1982, the state has issued 395 permits for mountaintop removal operations in Eastern Kentucky.[5] Mountaintop mining represents 10 to 15 percent of Kentucky's coal industry, according to the Kentucky Coal Association.[6]

The use of mountaintop mining has come under public scrutiny after a lawsuit was filed in West Virginia claiming the practice was impairing water quality and did not meet the requirements of the federal Clean Water Act. In October 1999, a federal judge ruled that mountaintop removal and the use of valley fills for the disposal of spoil violated both the Clean Water Act and federal coal law.[7] Recently, however, a federal appeals court overturned the ruling indicating that it should have been heard in a state court. The ruling will be appealed, according to the West Virginia Highlands Conservancy, the group that filed the lawsuit.[8] The federal Office of Surface Mining (OSM), has indicated that mountaintop operations raise a number of other complex issues that are partially or wholly outside the confines of federal mining laws. These are currently under study by OSM and other federal agencies.

One of the controversial aspects of mountaintop mining is the use of valley fills. Valley fills are earth and rock structures designed and constructed for the permanent depositing of excess rock and dirt from mining operations. This deposited material is known as a valley fill. These fills can encroach upon stream segments. It is estimated that more than 900 miles of intermittent and perennial streams have been buried by valley fills in Appalachia.[9] In Kentucky, valley fills have impacted approximately 300 miles of streams during the past two decades.[10] A task force is currently considering how

federal agencies can better coordinate various issues associated with valley fills and mountaintop mining practices. The Kentucky Department of Surface Mining has been working to minimize the size of valley fills and has also eliminated the practice of "wing dumping," the dumping rock and dirt from the top of the mountain into nearby streams and valleys. The department is also reviewing existing permits to determine if the post-mining land use for mountaintop removal operations and valley fills were properly issued and in compliance with state rules.[11]

Footnotes

1. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.
2. 1999 Annual Report, Ky. Department of Mines and Minerals.
3. 1999 Annual Report, Ky. Department of Mines and Minerals.
4. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.
5. Ky. Department for Surface Mining Reclamation and Enforcement, March 2001.
6. "Mountaintop-mining decision overturned, by Brian Farkas, Associated Press, April 25, 2001.
7. "Mining the Mountains," The Charleston Gazette On-line, October 21, 1999.
8. "Mountaintop-mining decision overturned, by Brian Farkas, Associated Press, April 25, 2001.
9. Remarks of W. Michael McCabe, EPA Regional Administrator, Public Hearing on Valley Fills/Mountaintop Removal, Logan, West Virginia, Oct. 24, 1998, Web site - http://www.epa.gov/region3/r3oped/oped99-37.htm.
10. This number has been generated by the Ky. Department of Surface Mining Reclamation and Enforcement by measuring the blue-line streams identified on U.S. Geological topographic maps. There may be significant discrepancies on these maps and the number may be significantly overstated, but it is currently the only tool available to make such a determination, according to the Ky. Department of Surface Mining Reclamation and Enforcement.
11. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.

Measures - notes and sources

***Measure 1**. *Includes strip, auger, and auger/strip. Source: Ky. Department of Mines and Minerals.*
***Measure 2**. Surface mining is primarily the use of mountain top and contour mining in east Kentucky and area mining in west Kentucky. Underground mining is primarily the use of room and pillar, long wall, and drift mining techniques. Auger mining is used in east Kentucky and extracts coal from underneath the remaining mountain or hill top. Source: KY Department of Mines and Minerals.*
***Measure 3**. *Acres only reflect those permitted acres brought under permit during those calendar years. Does not include acreage added under permit revisions or amendments. 1984 acreage not shown (517,000 acres repermitted in 1984 as a result of transition from interim to permanent program which also includes acreage permitted for the first time that overlays underground mine workings). **Acreage disturbed by permitted mines either actively mining or in some stage of reclamation as of December 30 for each year provided. Earlier data not available. Source: Ky. Department for Surface Mining Reclamation and Enforcement.*
***Measure 4**. Source: U.S. Energy Information Administration.*
***Measure 5**. Source: U.S. Energy Information Administration.*

Indicator 3. Coal Production Waste

At a Glance

Number of coal slurry impoundments
U.S. 653
Kentucky 88

Kentucky coal slurry impoundments
investigated. 70
with problems 9

Background The mining of coal creates a significant amount of waste. Before passage of the federal Surface Mining Law in 1977, it was a common practice in steep-sloped areas of Appalachia to dispose of excess spoil by pushing it down the mountain.[1] Under the Surface Mining Law, excess spoil is required to be permanently stored in engineered spoil fills.

The cleaning of coal also creates waste. Run-of-the-mine coals are washed in water to remove non-combustible mineral matter from coal. The costs of cleaning fine coal particles are substantially higher than those for cleaning coarse coal.[2] Therefore, many companies discard them along with water to fine coal impoundments. In general, 5 to 10 percent of the coal mined in the eastern United States is too fine to be cleaned efficiently, and perhaps more than one half of it is being discarded.[3] According to a recent survey conducted by U.S. Department of Energy, approximately 2.5 to 3 billion tons of fine coal has been deposited in impoundments.[4] Coal impoundments typically have a life of up to 20 years and are several acres in size. All impoundments must be drained and reclaimed prior to the release of a coal mine bond.

The issue of coal slurry impoundments rose to public attention after the failure of an impoundment near Inez, Ky. on Oct. 11, 2000. An estimated 250 million gallons of coal slurry and water broke through the 72-acre impoundment into underground mines works at a coal preparation plant owned by Martin County Coal Corp., a subsidiary of A.T. Massey Coal Co. Inc. The slurry/water mixture flowed into Coldwater Fork and Wolf Creek before making its way into Tug Fork, a tributary of the Big Sandy River. The spill impaired an estimated 60 miles of waterways along the Kentucky and West Virginia border. Gov. Paul Patton declared a state of emergency in 10 eastern Kentucky counties affected by the spill. The spill closed schools and businesses and disrupted drinking water service to hundreds of people. The company has been cited for violating Clean Water Act rules. Martin County Coal is in the process of cleaning up the spill.

Measure 1. High-Risk Coal Impoundments in Kentucky

Impoundment	County	Coal Company
Little Camp Branch	Bell	CC Coal
Butler Branch	Floyd	Bull Creek Coal
Left Fork,Turtle	Harlan	New Horizons Coal
Louder Creek	Harlan	Jericol Mining
Beartree Branch	Harlan	Manalapan Mining
Turkeypen Branch	Harlan	Harlan Cumberland
Right Fork, Turtle	Harlan	New Horizons
Left Fork, Wendover	Leslie	Leslie Resources Inc.
Clay Hollow	Letcher	Cook & Sons Mining
Holty Branch	Martin	Peter Cave Mining
Slurry Cells D1, D2	Martin	17 West Mining
River Queen	Muhlenberg	Peabody Coal
Saddle Fork	Perry	Leeco
Harris Branch	Perry	Buckhorn
Lick Fork	Perry	Leeco
Long Fork	Pike	Long Fork Coal
Bear Hollow	Pike	Sunny Ridge Mining
Enterprise	Pike	Premier Elkhorn Coal
Rob Fork	Pike	Branham & Baker
New Ridge	Pike	Sidney Coal

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress Nationwide, there are an estimated 653 coal slurry impoundments.[5] In Kentucky, there are 88 coal slurry impoundments. The U.S. Mine Safety and Health Administration has ranked 20 impoundments in Kentucky as high risk for breakthrough potential, nine as moderate risk and the remainder as low risk.[6] An impoundment being ranked as a high or moderate risk does not necessarily mean that a fail-

ure is expected, but that greater attention and study needs to be paid to the safety of the impoundment.

The Martin County coal spill is under investigation by state and federal officials. In the meantime, state surface mining officials are conducting a review of Kentucky's 88 slurry impoundments. As of March 2000, 70 sites have been investigated. Of these, nine required changes in design to prevent failure and two were cited for not following the approved plans.

Alternatives to coal slurry impoundments are also under review. Two million dollars has been allocated by Congress to assess alternative options and improve methods for storing coal slurry waste. As of May 21, 2001, there were 16 applications pending in Kentucky to modify or build new coal slurry impoundments.

Footnotes

1. *National Energy Policy: Coal, Subcommittee on Energy and Air Quality hearing, U.S. Congress, presentation by Dr. Roe-Hoan Yoon, Director, Virginia Center for Coal and Minerals Processing, Virginia Tech, March 14, 2001, Web site - http://www.house.gov/commerce/hearings/03142001-94/Yoon128.htm.*

2. *Ibid.*

3. *Ibid.*

4. *Ibid.*

5. *Coal Waste Dams and Impoundments, U.S. Mine Saftey and Health Administration, Web site - http://www.msha.gov/impoundments/impoundmenthp.htm.*

6. *Ibid.*

Measures - notes and sources

Measure 1. *Source: U.S. Mine Safety and Health Administration.*

Reclamation of Coal Mines

Indicator 4. Reclamation of Coal Mines

At a Glance

Acres of permitted coal minelands reclaimed total to date . . .612,000
1999 20,000

Background Reclamation is a standard and integral part of coal mining operations. A coal operator must post a performance bond (ranging as high as $10,000 per acre) sufficient to cover the cost of restoring the site to assure reclamation.[1] This must be done before a permit can be granted. The bond is not fully released until the final revegetation of the site has been determined to be successful – this time period could be up to 10 years following reclamation. Nationwide, an estimated 2.5 million acres of coal mined lands have been reclaimed.[2]

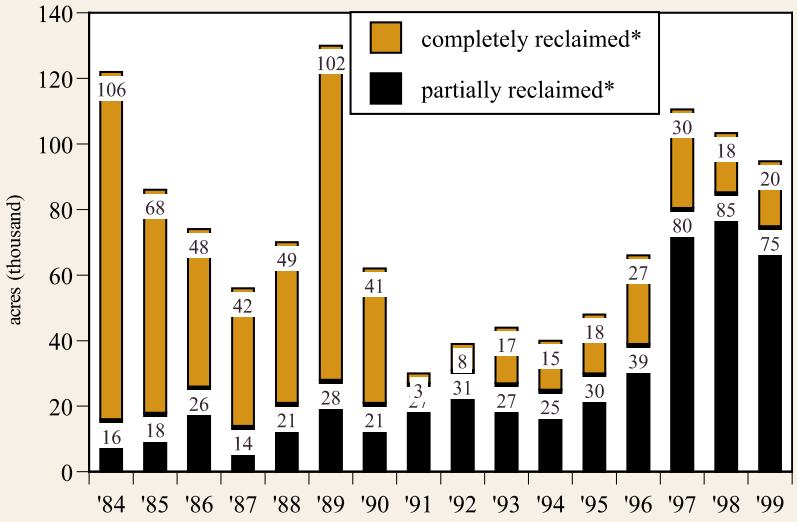
Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress Since 1984, 612,000 acres of permitted mine lands have been reclaimed in Kentucky. There has been an increase in partially reclaimed lands in Kentucky during recent years as more coal mines close and reclamation takes place.

While data are not available for the state to determine the extent of what land uses mine lands have been reclaimed to (agriculture, development site, forestland), state surface mining officials report that about half of the mine lands in Kentucky are reclaimed to hay and pastureland at the request of the landowner. Coal companies prefer to reclaim with grasses because it is easier to establish a ground cover in order to meet coal mine bond release requirements.

Efforts to promote forests as a post-mine reclamation land use became a state priority in 1996 after the Environmental Quality Commission found that current grading practices discouraged the use of trees as a reclamation option due to excessive soil compaction and other requirements. In response, the Natural Resources and Environmental Protection Cabinet established a work group to review current reclamation practices that impact tree survival and develop guidance that would promote trees on mined lands. On March 10, 1997, the Kentucky Department of Surface Mining issued a Reclamation Advisory Memorandum (RAM) #124 to promote reforestation of mine lands. The emphasis of this initiative has been to support the establishment of high-value hardwood forests (oaks, walnuts, poplars and ash) that would

Measure 1. Coal Mine Acres Reclaimed in Kentucky



provide a long-term renewable resource for the coalfield residents. State surface mining officials have been working closely with the University of Kentucky on the development and construction of approximately 100 acres of reforestation test plots. The ongoing field studies indicate that surface mined lands are very capable of supporting high-value forests if properly reclaimed, usually by limiting excessive compaction. The Kentucky Natural Resources and Protection Cabinet recently received a $2 million grant from OSM to promote the reforestation of hundreds of acres mine lands.

Since issuance of RAM #124, there has been an increase of approximately 15 percent in the number of surface mining applications that propose a postmining land use that requires the planting of trees and shrubs. Due to the success of Kentucky's "Reforestation Initiative," several other states (West Virginia, Virginia, Ohio, Tennessee) have begun their own reforestation initiatives and the federal Office of Surface Mining has started a federal initiative of its own.

Footnotes

***1**. Reclamation Success, Coal Mining Reclamation, Mineral Information Institute, Web site-http://www.mii.org/coal/coal.html.*
***2**. Ibid.*

Measures - notes and sources

***Measure 1**. *Based on partial or full coal mine bond releases. Source: Ky. Department for Surface Mining Reclamation and Enforcement.*

Coal Mine Bond Forfeitures

Indicator 5. Coal Mine Bond Forfeitures

At a Glance

Coal mine operations with bonds 7,958
value . . . . $792 million

Forfeiture of bonds in 1999
mine operations . . 28
acres 701
value $890,000

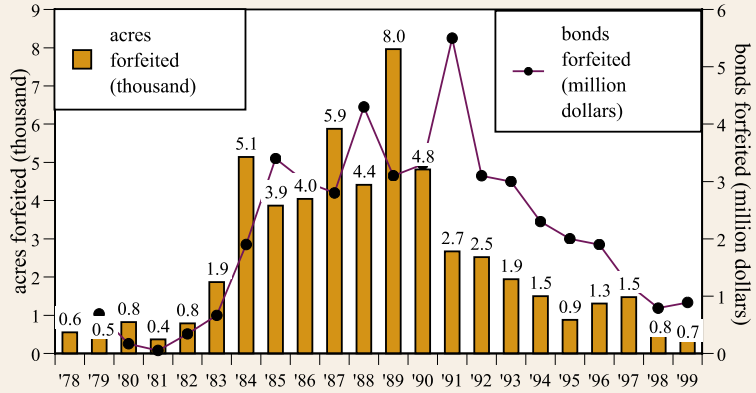
Background All coal mines are required to post financial assurance bonds to ensure reclamation of a site. Bond amounts vary based on the mine and type of operation. State regulatory officials currently hold $792,438,602 in bonds for 7,958 coal mine operations, 2,349 of which are active operations.

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

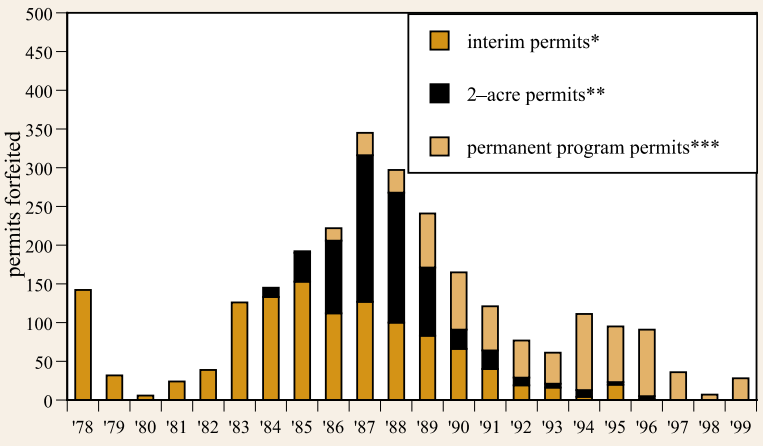
Progress The forfeiture of coal mine permits and bonds due to the failure to properly operate or reclaim a site continues to decline in Kentucky. In 1999, $890,000 in bonds were forfeited under 28 coal mine permits containing 701 acres. This forfeited acreage represents less than 1 percent of the 95,000 acres completely or partially reclaimed in Kentucky that year.

In the past, concerns had been expressed that coal mine bonds were inadequate to reclaim a mine site. A 1993 study commissioned by the state found that 36 percent of the 42 mines assessed were considered to have inadequate reclamation bonds. In response, the state created a Supplemental Assurance Fund in 1994 to assure reclamation of sites with approved highwalls in excess of normal regulatory requirements. Monies posted by the permittee are in addition to and distinct from the reclamation bond required under federal law. Monies are returned to the permittee once rough backfilling and grading have been completed. As of September 1999, the state held $38.3 million in supplemental assurance funds. The state also passed legislation in 1998 to create a bond forfeiture fund financed by interest accrued from forfeited bonds and penalties. The fund is used to supplement bonds that are inadequate to reclaim a forfeited mine site.

Measure 1. Coal Mine Bonds and Acreage Forfeited



Measure 2. Coal Mine Permits Forfeited



Measures - notes and sources

Measure 1. *Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 2. **Inerim permits - issued to coal mines in operation from 1978 to 1992. **2-acre permit exemptions - issued to 2-acre mine operations from 1982 to 1987 which exempted operations from some performance standards. The 2-acre exemptions were repealed in 1987 due to mining abuses. **Permanet program permits - cover operations that were active on or that began after 1982. Source: Ky. Department of Surface Mining Reclamation and Enforcement*

Indicator 6. Coal Mine Compliance and Enforcement Actions

Background The environmental impacts of coal mining have been regulated to some degree in Kentucky since 1966. But it was not until the passage of the 1977 federal Surface Mining Control and Reclamation Act (SMCRA) that the state began to more fully address the impacts of mining on the environment.

Kentucky obtained federal authority to carry out the provisions of the SMCRA in 1982. Since then, the Kentucky Department of Surface Mining Reclamation and Enforcement (DSMRE) has been the primary regulatory authority, while the U.S. Office of Surface Mining has maintained an oversight role to ensure compliance with the federal law. In 2000, DSMRE was responsible for overseeing compliance on 682 active and 1,565 inactive mine sites (inspectable units).[1]

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

At a Glance

Number of coal mine inspections
1990 43,000
1995 34,000
1999 26,000

Number of violations
1993. 2,097
1996. 1,619
1999. 757

Compliance of coal mines (1999) 81%

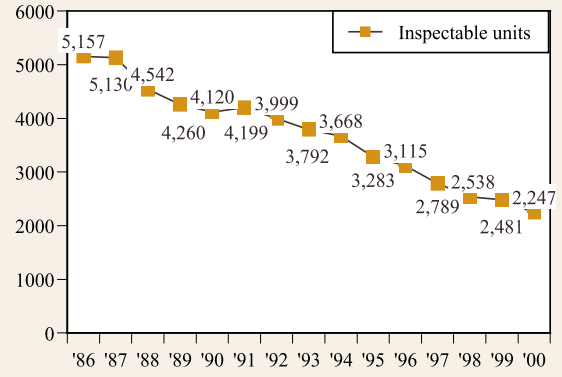
Progress The state is required by law to conduct eight partial and four complete inspections on each active coal mine permit per year. Inspections have been decreasing since 1986. DSMRE indicates that this decrease is primarily due to the decline in the number of mines and a shift from active to inactive mine sites due to the completion of mining and reclamation. During 1999, 103 inspectors conducted 26,000 complete and partial inspections of active mining operations.

Trends reveal that compliance with coal mining rules in Kentucky continues to improve. During 1999, the federal Office of Surface Mining reported that 81 percent of coal operations were in compliance with mining laws (based on random surveys). The number of citations issued by DSMRE dropped by more than half since EQC last reported on this indicator, from 1,801 in 1996 to 942 in 1999. During 1999, 45 percent of the active coal mine permits had one or more citations for violations of coal mining performance standards. This continued drop in citations is attributed to a decline in the number of permits issued, improved compliance of operators and a stronger state emphasis on preventative enforcement.

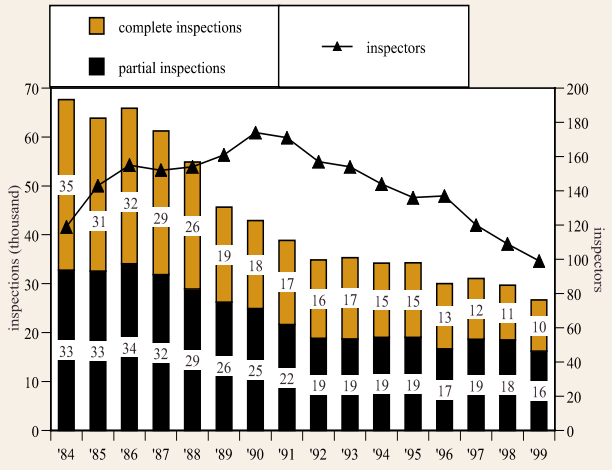
During 1999, off-site disturbances were the most frequently cited performance standard violation at coal mines, followed by backfilling and grading violations.

Penalties assessed against coal operators show declining trends as well. According to DSMRE, this decrease is attributed to violations that can be quickly abated because they are less serious in nature. This also reflects a trend in coal mining toward fewer and larger companies that are more able to meet regulatory requirements and remedy violations in a timely manner, according to state officials. In fiscal year 1999, $3.34 million in penalties were assessed and $959,000 in coal mine penalties were collected. The penalties collected have remained fairly constant during the past several years, averaging 27 percent of fines assessed each year. According to DSMRE, a large amount of fines cannot be collected due to bankruptcies or a lack of company assets.

Measure 1. Number of Coal Mine Inspectable Units in Kentucky



Measure 2. Inspections of Coal Mines

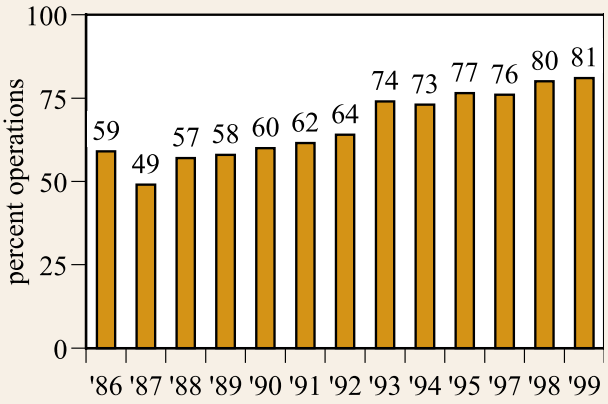


Coal Mine Enforcement

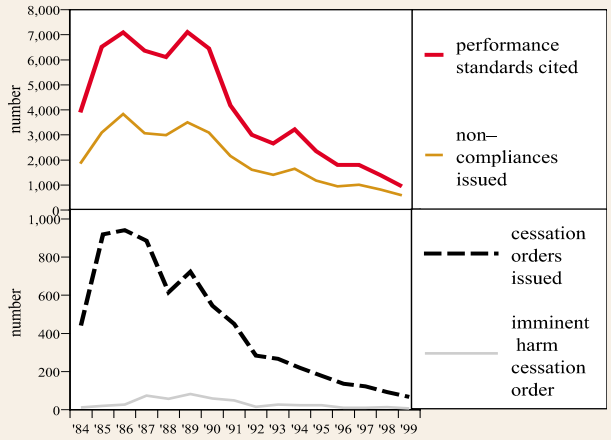
Footnotes

1. Eighteenth Annual Evaluation Summary Report for the State of Kentucky, Table 6b, U.S. Office of Surface Mining.

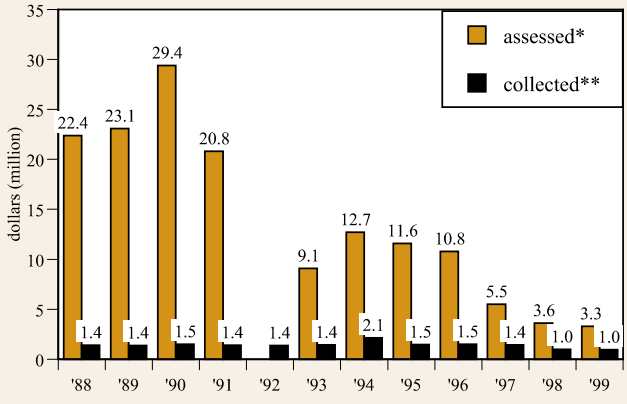
Measure 3. Kentucky Coal Mine Compliance



Measure 4. Coal Mine Violations in Kentucky



Measure 5. Coal Mines Penalties



Measures - notes and sources

Measure 1. *OSM Annual Evaluation Report, 2000.*

Measure 2. *Includes 8 partial and 4 complete inspections per active coal mine permit per year. Includes inspections of inactive and abandoned mines. Source: Ky. Dept. of Surface Mining Reclamation and Enforcement.*

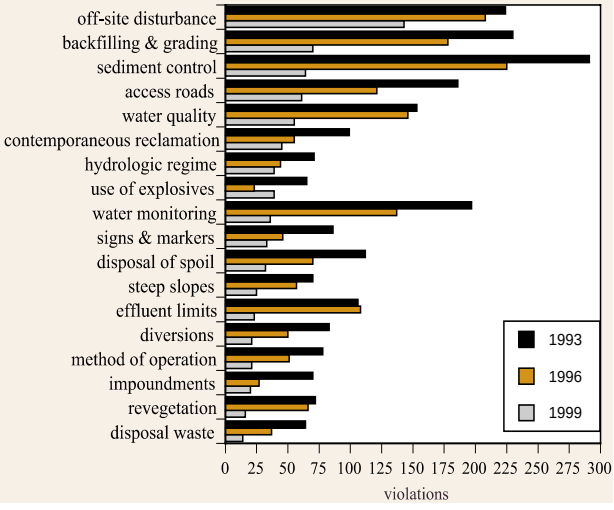
Measure 3. *Based on random oversight inspections conducted by the federal Office of Surface Mining. 1996 data not included due to changes in inspection procedures. Source: U.S. OSM Annual Evaluation Reports.*

Measure 4. *Performance standards - specific standards that must be met according to state and federal rules. Noncompliance - documents violations, remedial measures and schedules for completion of actions. Cessation order - requires operator to cease operations for failure to abate violation and until violation is corrected. Imminent harm cessation order - requires operator to cease operations due to imminent harm or potential danger to the public and environment. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 5. **1992 data not available due to computer problems. **Collections may include assessments from any given year. Source: Ky. Natural Resources and Environmental Protection Cabinet, Office of Administrative Hearings.*

Measure 6. *Based on violations of performance standards. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 6. Most Frequently Cited Coal Mine Violations in Kentucky



RESOURCE EXTRACTION

COAL MINE COMPLAINTS

Indicator 7. Coal Mine Complaints

Background Each year, hundreds of complaints concerning active, inactive and abandoned coal mines are received by state officials. State officials are required to investigate all complaints. Many complaints concern coal mine blasting. Kentucky leads the nation in the use of explosives. In 1999, 2.12 million metric tons of explosives were sold in the United States—411,000 metric tons of which were sold in Kentucky. Coal mining accounts for 67 percent of the total national sales of explosives.[1]

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress During 1999, state surface mining officials received 846 citizen coal mine related complaints, the lowest number recorded since 1984. State officials note that this is likely due to the steady decrease in the number of mines in Kentucky. About 11 percent of citizen complaints result in a coal mining operation being cited for a violation.

Forty-two percent of the coal mine complaints concerned blasting. Since 1996, the number of blasting related complaints has increased by 24 percent. Blasting complaints often allege subsidence and damage to private water well supplies. In 1992, the federal surface mining law was amended to require all underground coal mining operations to promptly replace certain identified water supplies adversely affected by subsidence from underground coal mining operations. In response to the new federal requirements, the Kentucky General Assembly passed a bill in 1994 requiring replacement of water supplies lost due to underground mining. Between 1994 and 1999, 596 cases alleging underground coal mining damage to water supplies have been filed under the provisions of the law.

At a Glance

Number of coal mine complaints
1990 983
1995 954
1999 846

Leading coal mine complaints (percent)
blasting 42%
water quality 9%
off-site 6%
dust 5%
subsidence 4%

Footnotes

1. Explosives" by Deborah Kramer, Institute of Makers of Explosives, 1999.

Measures - notes and sources

***Measure 1**. *General obligation refers to: illegal disposal of waste outside of permit area, causing imminent danger to public or the environment, lack of a permit, or failure to notify DSMRE of problems. Based on 846 complaints received in 1999. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

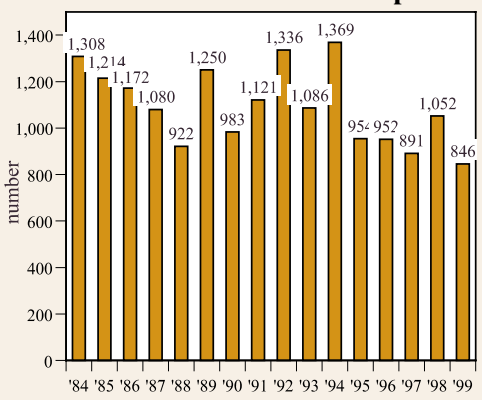
***Measure 2**. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

***Measure 3**. Source: Institute of Makers of Explosives.*

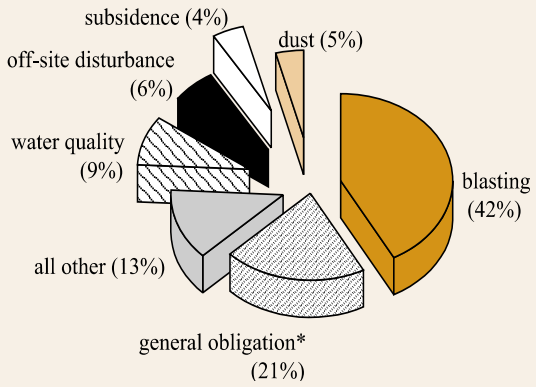
Measure 3. Leading States for Explosives Consumption (1999)

State	metric tons
Kentucky	**411,000**
West Virginia	214,000
Nevada	125,000
Pennsylvania	114,000
Arizona	109,000
Virginia	96,000
Alabama	92,000
Ohio	70,000
Missouri	47,000
North Carolina	46,000

Measure 2. Coal Mine Complaints



Measure 1. Coal Mine Complaint Types



Abandoned Mine Lands

Indicator 8. Abandoned Mine Lands

At a Glance

Abandoned mine land acres reclaimed.20,095
# of projects . . 1,300

Abandoned mine lands in Kentucky still requring reclamation . . 80,000-150,000 acres

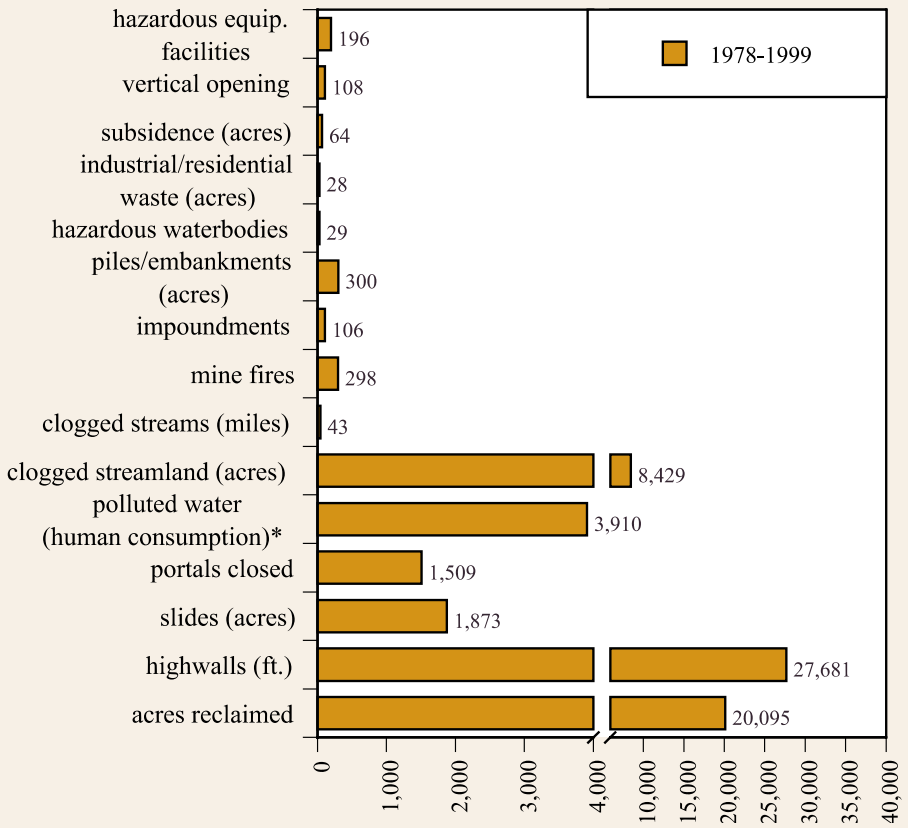
AML fund (million of dollars)
fee collection. . $759.2
awards $350.1

Background The federal Abandoned Mine Land Reclamation Program (AML program) was established to address mine lands abandoned prior to 1982. Kentucky received federal authority to carry out this program in 1982. The Kentucky Division of Abandoned Mine Lands oversees all AML projects in the state with the exception of emergency projects, which are handled by federal Office of Surface Mining.

The AML program is supported by a fee of 35 cents per ton on surface mined coal, 15 cents per ton on coal mined underground, and 10 cents per ton on lignite. This money is held in an interest bearing Abandoned Mine Land and Reclamation Fund (AML fund) by the federal government and allocated back to states and tribes for mine reclamation purposes. The fee is authorized until 2004.

Expenditures from the AML Fund are authorized through the regular congressional budgetary and appropriations process. Federal law specifies that 50 percent of the AML fees collected be returned to the state of origin for reclamation projects. The remainder of the fees are retained by the federal government to support administrative costs of the program, emergency reclamation projects, and additional discretionary grants to the states based on historical coal extraction.

Measure 1. Abandoned Mine Land Projects in Kentucky



Goal Provide for the restoration of lands mined and abandoned or left inadequately restored prior to 1977.

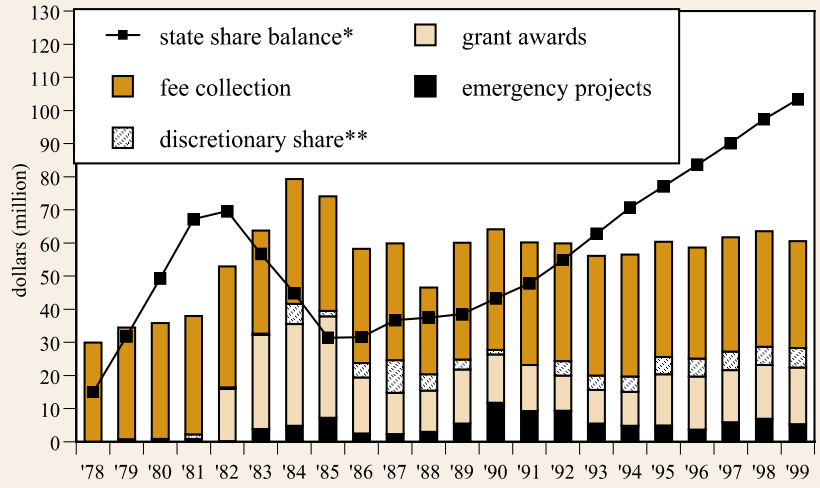
Progress Nationwide, from 1978 through 2000, $5.8 billion in AML fees have been collected and $1.3 billion worth of coal-related high priority sites reclaimed.[1] In Kentucky, the coal industry has paid $759.2 million in AML fees. The state has received $350.1 million in AML grants. Of this total, $74.2 million was in discretionary AML funds based on historical coal extraction. The state's share balance (what is owed to the state and held in trust by Congress) was $101 million in 2000.[2]

From 1978 to 2000, Kentucky reclaimed 20,095 acres of abandoned mine lands using AML funds, and more than 1,300 projects were com-

pleted to address abandoned mine land problems.[3]

Most AML funds used in Kentucky are for restoring sites and for projects that pose imminent threats to human health and safety. Projects include the elimination of highwalls, clearing clogged streams, restoring potable water supplies and stabilizing slides. During 1998 and 1999, Kentucky undertook a major abandoned mine land reclamation project. The Pleasant View Mine Site, located near Madisonville, was mined in the 1930s and 40s. Later mining operations in the 1960s left millions of tons of acid coal refuse polluting water in a large pit to such a degree that it was a deep red color and became known as "Ketchup Lake." The site was classified as a threat to public health and safety in 1997. Reclamation activities moved and estimated 2.5 million cubic yards of materials at a cost of $4 million. The reclamation of the 250-acre site has resulted in the restoration of Grassy Creek watershed. The project was recognized by the U.S. Office of Surface Mining in 2000 and received a regional and national award from the agency.

Measure 1. Abandoned Mine Land Fund Fee Collection and Allocation in Kentucky



Nationwide, some 16,870 projects, amounting to $8.2 billion, await AML funding.[4] There are an estimated 80,000 to 150,000 acres of abandoned mine lands in Kentucky that are potentially eligible for reclamation.[5]

Footnotes

1. Abandoned Mine Reclamation Update, Office of Surface Mining, 2000.
2. State Share Balance, Current status, Office of Surface Mining, Web site - http://www.osm.gov/fundstateshare.htm.
3. Ky. Division of Abandoned Mine Lands.
4. Abandoned Mine Reclamation Update, Office of Surface Mining, 2000.
5. As estimated by the Ky. Division of Abandoned Mine Lands.

Measures - notes and sources

***Measure 1**. *Selected state AML priority 1 & 2 (protection of public health, safety, and general welfare) and federal AML emergency projects. *Customers served. Source: U.S. Office of Surface Mining.*

***Measure 2**. *Cumulative balance of fees collected and not returned to Kentucky as specified under federal AML law. **Additional AML Funds based on historical coal extraction. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

***Measure 3**. *Funds reobligated to the 19th annual grant. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 3. AML Program in Kentucky (1999)

Receipts	
AML Grant	$18,609,414
Expenditures	
Program Adm.	$3,505,645
Project Costs	$14,032,416
Deobligated*	$1,071,353
Projects Funded	
Clogged streams	14.2 acres
8 waterlines	78.3 miles
Haz. waterbodies	4
Portals closed	36
Slides	89.9 acres
Haz. equipment	12
Highwalls	2,306 feet
Vertical openings	3
Piles & embankments	16.3 acres

Oil & Gas Production

Indicator 9. Oil and Natural Gas Production and Consumption

At a Glance

Number of oil wells
1992 730
1995 612
1999 226

Oil production (million barrels a day)
1992 15
1995 10
1999 8

Number of gas wells
1992 303
1995 249
1999 341

Natural gas production (trillion cubic feet)
1992 80
1995 75
1999 77

Background Kentucky and the nation consume large amounts of petroleum and natural gas to meet our energy needs. In fact, the United States is the world's greatest consumer of petroleum—using two to three times more than any other country.[1] In Kentucky, the consumption of petroleum for transportation alone rose 188 percent between 1960 and 1999.[2] This trend reflects the increased mobility of Kentucky's growing population as well as expansion of airports and increased airline traffic.

Kentucky has been producing oil and natural gas since 1818. In 1999, the value of oil and natural gas production was more than $200 million, bringing Kentucky more than $9 million in tax revenues.[3] The state has large untapped natural gas resources that include shut-in shallow production, coalbed methane and considerable deep potential.[4]

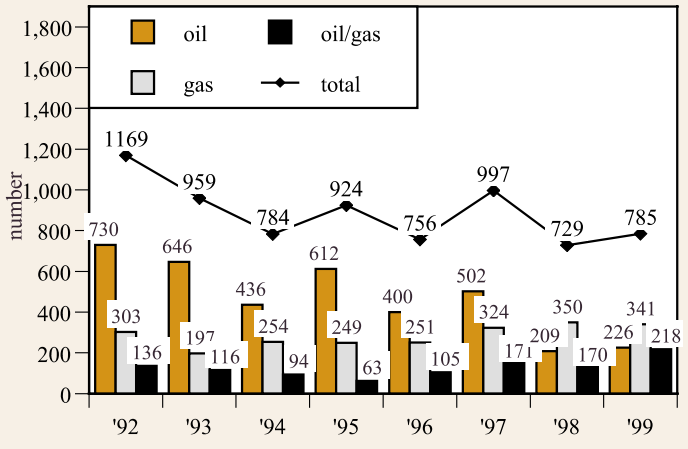
Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress The state began a permitting program for oil and gas wells in 1960. Since then, 90,838 oil and gas permits have been issued of which 46,134 are productive wells. The total number of oil and gas permits issued each year continues to decline, primarily due to market conditions and falling oil prices.

Kentucky ranks 20th among 31 states with oil production.[5] The state produced 2.8 million barrels of oil in 1999, about 0.13 percent of the 2.1 billion barrels produced in the United States that year. Oil production occurs in 59 counties. During 1999, 49 percent of the state's oil production occurred in west Kentucky. Crude oil production levels have been steadily declining in the state, dropping from 17,704 barrels a day in 1986 to 7,560 barrels a day in 1999. This decline is attributed to the low and variable price of crude oil on the world market. However, price increases in 2000 (if maintained) and growing demand may lead to increased oil production in Kentucky. Kentucky's and the nation's consumption of finished petroleum products continues to increase. For example, between 1986 and 1999, U.S. petroleum consumption rose by 19 percent while Kentucky use increased by 35 percent.

Kentucky ranks 17th among 29 states with natural gas production.[6] In 1999, the state produced 77 billion cubic feet; 0.38 percent of the nation's 24 trillion cubic feet of gas. There are 24 active natural gas fields covering 35 counties. Nearly all natural gas production, about 99 percent, occurs in the eastern part of the state. Officals at the Kentucky Geological Survey predict that rising natural gas prices will likely lead to an increase in gas production over the next few years in Kentucky. The preliminary gas production estimate for the year 2000 in Kentucky is about 80.8 billion cubic feet, a five percent increase over 1999 production levels.[7]

Measure 1. Oil and Gas Permits in Kentucky



Footnotes

1. U.S. Department of Census. Statistical Abstract of U.S., 2000.
2. State Energy Data Reports, Energy Information Administration, 1960-97.
3. Kentucky Geological Survey, Web site - http://www.uky.edu/KGS/emsweb/oginfo/intro.html.
4. Ibid.
5. Petroleum Annual 1999, Energy Information Administration.
6. Natural Gas Annual 1999, Energy Information Administration.
7. Ky. Geological Survey, May 2001.

RESOURCE EXTRACTION

OIL & GAS PRODUCTION

Measures - notes and sources

Measure 1. **As issued by Ky. Division of Oil and Gas. Data prior to 1992 not available. Source: Ky. Department of Mines and Minerals.*

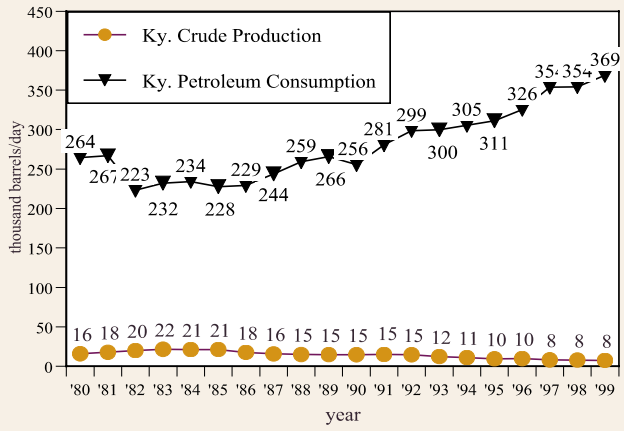
Measure 2. *Totals rounded. 1999 is the most recent data for petroleum consumption in Kentucky. Source: U.S. Energy Information Administration, Ky. Geological Survey.*

Measure 3. *Source: Ky. Geological Survey.*

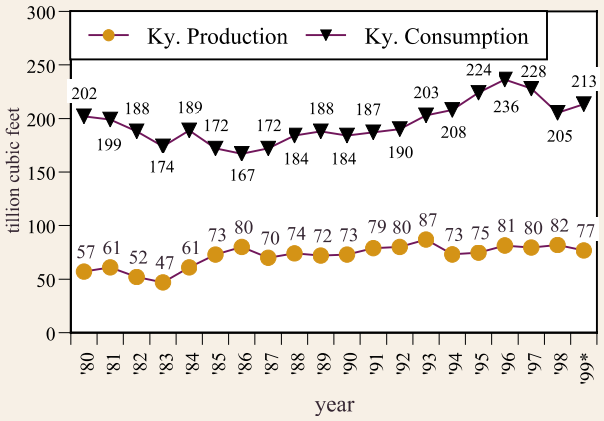
Measure 4. *Source: U.S. Energy Information Administration.*

Measure 5. *Source: Ky. Geological Survey.*

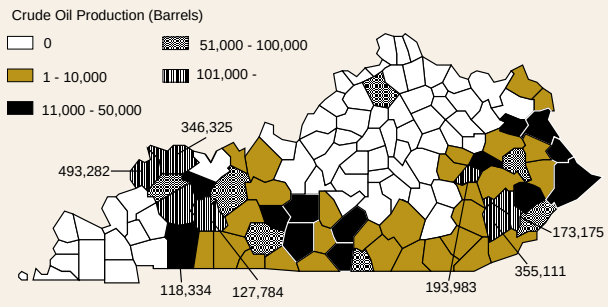
Measure 2. Crude Oil Production/ Petroleum Consumption in Kentucky



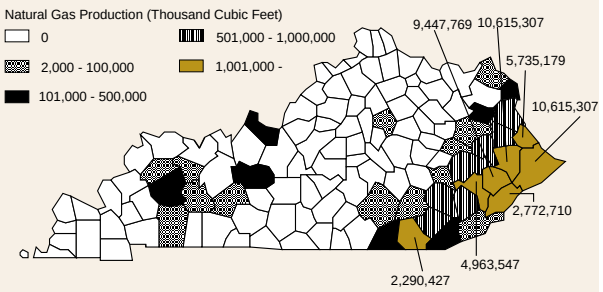
Measure 4. Natural Gas Production/ Consumption in Kentucky



Measure 3. Crude Oil Production in Kentucky (1999)



Measure 5. Natural Gas Production in Kentucky (1999)



Oil & Gas Enforcement

Indicator 10. Oil and Gas Well Compliance and Enforcement

At a Glance

Inspections of oil and gas wells
1992 2,822
1995 3,740
1999 2,823

Violations at oil and gas wells
1992 1,702
1995 532
1999 1,316

Background The Kentucky Department of Mines and Minerals, Division of Oil and Gas was established in 1960 to foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

State oil and gas officials report that most environmental problems occur at older oil wells and small independently-owned wells. Pollution from oil and gas wells can be caused by oil, grease and brines associated with production. Brine, which can contain more salt than sea water, is currently impairing water quality in five of the state's 13 river basins.

Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress During 1999, the Division of Oil and Gas 16 inspectors conducted more than 2,823 inspections of oil and gas operations. At least four inspections are conducted during the life of a well to ensure proper construction, operation and plugging.

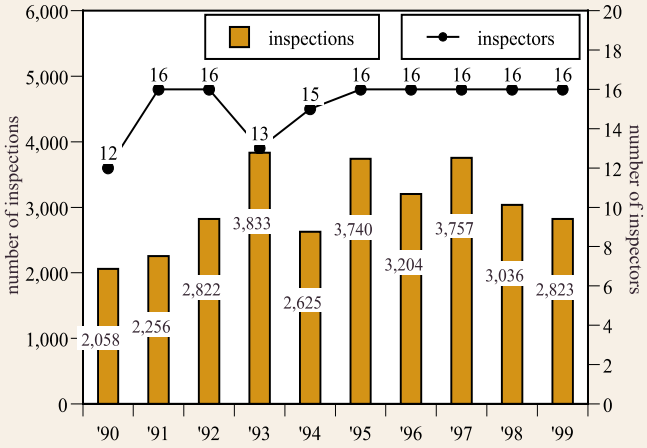
During 1999, 1,316 violations were cited at oil and gas wells by the Division of Oil and Gas inspectors. Improper well closure was the leading violation, accounting for 43 percent of 1,316 violations cited. The greatest number of the violations cited in 1999 occurred in Ohio County (127 violations), followed by Daviess County (77 violations), Clay County (57 violations), Hancock County (57 violations), McLean County (53 violations), and Adair County (46 violations).

Inspections are also conducted at oil and gas wells by Division of Water inspectors. During 1999, 3,924 inspections were conducted and 65 water quality violations were cited at oil and gas well operations. Division of Water officials report that a strong enforcement presence combined with better industry compliance and a decline in oil production have reduced violations and the level of chlorides in several waterways.

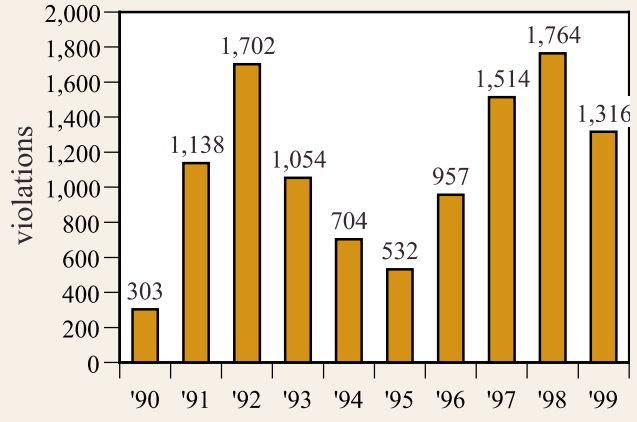
Division of Oil and Gas inspectors also responded to 42 citizen complaints in 1999 — a relatively low number considering there were 46,134 producing oil and gas wells. Most complaints concern abandoned wells, groundwater or dust.

Because the Division of Oil and Gas does not have the authority to assess fines against violators, it must rely on bond forfeitures as its primary enforcement tool. In 1999, 85 bonds were forfeited—the lowest number since 1991, when EQC began to report on oil and gas bond forfeitures. State officials attribute the recent decline in bond forfeitures to market pressures which have forced many marginal operators out of business. But the ratio of oil and gas bond releases to bond forfeitures still remains high. For example, in 1999, 100 bonds were released while 85 were forfeited. Bond amounts were increased in 1994 and now range from $500 for an individual well to $10,000 for multiple wells (based on well depth). However, state officials indicate that bond amounts still do not cover the complete cost of plugging and reclaiming a well site.

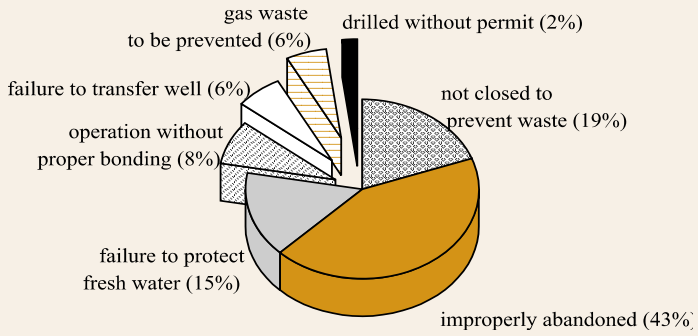
Measure 1. Oil and Gas Well Inspections



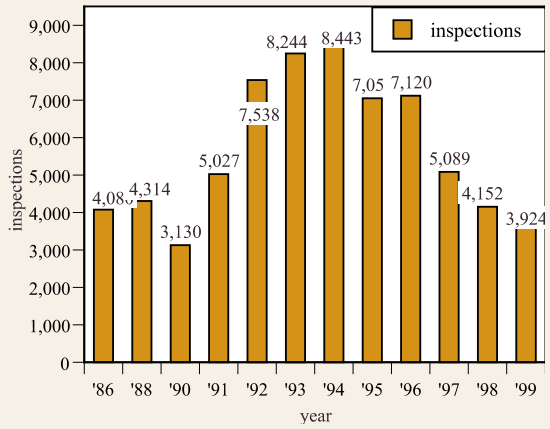
Measure 2. Oil and Gas Well Violations



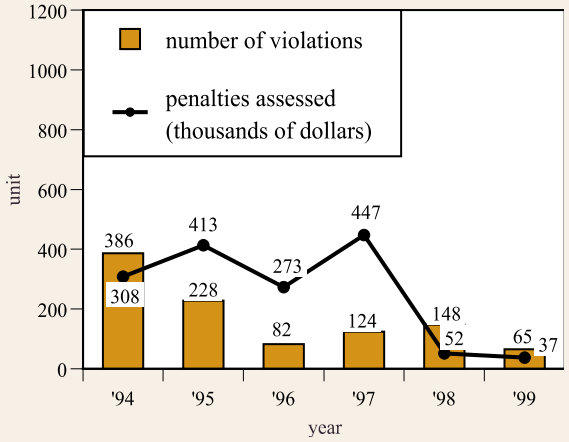
Measure 3. Oil and Gas Violations by Type



Measure 4. Oil and Gas Well Water-Quality Inspections in Kentucky



Measure 5. Oil and Gas Well Water Quality Violations



Another environmental threat posed by oil wells is waste created during the oil recovery process. Naturally occurring radioactive materials (NORM) can be brought to the surface and concentrated in oil pits and tank batteries. NORM was discovered in Kentucky in the Martha Oil Fields in Lawrence and Johnson counties in 1988. In 1995, the Cabinet for Health Services signed an agreement with Ashland Exploration Inc. to remediate certain NORM-impacted areas of the Martha Oil Field. To date, Ashland has excavated and is storing approximately 117,000 tons of NORM on a 3.77 acre site that straddles the border of Johnson and Lawrence Counties, with 2.89 acres in Johnson County and 0.88 acres in Lawrence County. The site is bounded by another 1,272 acres of company-owned property.

The Kentucky Natural Resources and Environmental Protection Cabinet has stated that the NORM-contaminated soil is a commercial residual solid waste. Ashland, Inc., filed a petition on May 22, 2000 to declare the NORM-contaminated soil a special waste. If NORM is declared a special waste, a notice would call for public comment on the issue. The cabinet is still formulating a draft decision.

Measures - notes and source

Measure 1. *Source: Ky. Division of Oil and Gas.*
Measure 2. *Source: Ky. Division of Oil and Gas.*
Measure 3. *Source: Ky. Division of Oil and Gas.*
Measure 4.. *Inspections conducted and violations cited by the Division of Water Field Operations Branch. Earlier data not available. Source: Ky. Division of Water.*
Measure 5. *In 1997 $150,000 of the $447,000 assessed was settled by the Cabinet for $30,000 in 1998 and this settlement is included in the 1998 number. Source: Division of Water.*

Abandoned Oil & Gas Wells

At a Glance

Number of abandoned oil and gas wells
U.S. 343,000
Kentucky 7,875

Number of wells plugged each year by state 200

Abandoned wells plugged to date by state 1,505

Indicator 11. Abandoned Oil and Gas Wells

Background According to the Interstate Oil and Gas Compact Commission, there are an estimated 343,030 idle wells in the United States that require proper plugging.[1] State law requires the Department of Mines and Minerals to regulate the plugging of all oil and gas wells in Kentucky. Administrative regulations promulgated under this authority identify the minimum acceptable requirements to plug or temporarily abandon wells. Unless written permission is obtained from the department, no operator or owner shall permit any well drilled for oil, gas, salt water disposal or any other purpose in connection with the production of oil and gas to remain unplugged after such well is no longer used for the purpose for which it was drilled or converted.

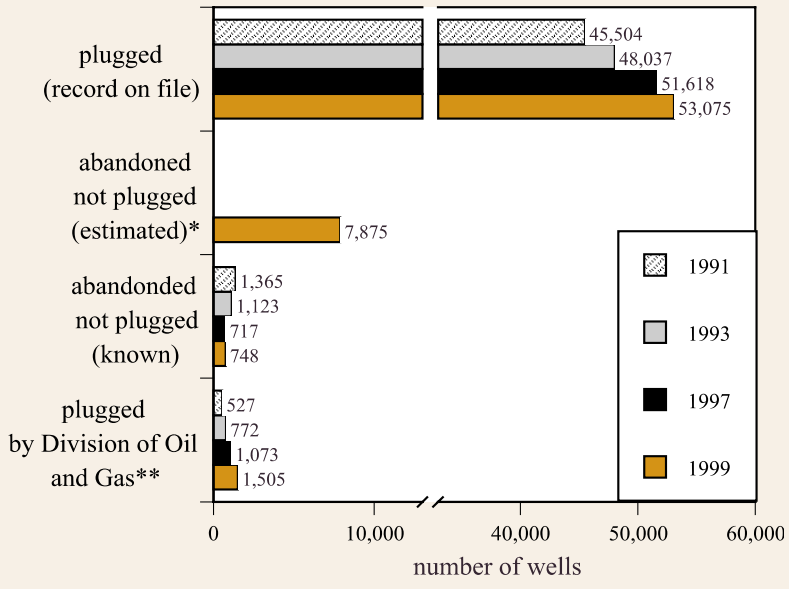
There are an estimated 7,875 abandoned oil and gas wells in Kentucky.[2] Improperly abandoned oil, gas and exploration wells pose a potential threat to the quality of groundwater supplies. Proper abandonment procedures require installation of cement plugs in the borehole to prevent migration of toxic fluids into nearby water-bearing formations. In some cases, however, plugs are installed improperly or neglected entirely, allowing oil, gas, brine and other unwanted material to contaminate freshwater aquifers.[3]

Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress State records reveal that more than 53,000 oil and gas wells have been plugged in Kentucky. During 1997, 1998 and 1999, an average of 485 wells was closed and plugged per year.

State efforts to plug abandoned oil and gas wells continue. The plugging of abandoned oil and gas wells is funded with interest money accrued from oil and gas reclamation bonds and bond forfeitures. The interest generally raises $400,000 a year—enough money to plug about 200 wells. As of 1999, the Division of Oil and Gas had plugged 1,505 abandoned oil and gas wells. Abandoned wells are prioritized and plugged based on potential hazards to the

Measure 1. Number of Plugged and Abandoned Oil and Gas Wells in Kentucky



environment. The average plugging cost is about $1,973 per well.[4]

The U.S. Environmental Protection (EPA) currently permits and regulates the injection of fluids and disposal of brine produced by oil and gas wells. There are 1,667 underground injection wells permitted in Kentucky. Another 1,645 wells are permitted but inactive. The Underground Injection Control program reports that a cumulative total of 2,288 injection wells in Kentucky have been closed and plugged to date. During 2000, 26 enforcement actions were taken by the U.S. EPA against operators for failure to comply with underground injection well rules.

Footnotes

1. *Press Release, Interstate Oil and Gas Compact Commission, August 2, 2000.*
2. *As estimated by the Ky. Division of Oil and Gas.*
3. *"Abandoned Wells Pose Threat to Water Quality," R. F. Kubichek, Associate Professor, J. C. Cupal, Associate Professor, S. Choi, Ph. D.Candidate, Electrical Engineering Department, University of Wyoming, January 1999.*
4. *Ky. Division of Oil and Gas.*

Measures - notes and sources

Measure 1. **Data revised by Ky. Division of Oil & Gas that appeared in previous State of Kentucky's Environment reports. **Cumulative total of oil and gas wells plugged by the Ky. Division of Oil & Gas. Source: Ky. Department of Mines and Minerals.*
Measure 2. *U.S. Environmental Protection Agency.*

Measure 2. Underground Injection (UIC) Wells in Kentucky